

1. Receive data

Channel Voice Messages

Note off

Status	2nd byte	3rd byte
8nH	kkH	vvH
9nH	kkH	00H

n = MIDI channel number: 0H - FH (ch.1 - 16)
kk = note number: 00H - 7FH (0 - 127)
vv = note off velocity: 00H - 7FH (0 - 127)

Note on

Status	2nd byte	3rd byte
9nH	kkH	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
kk = note number: 00H - 7FH (0 - 127)
vv = note on velocity: 01H - 7FH (1 - 127)

Control Change

Bank Select (Controller number 0, 32)

Status	2nd byte	3rd byte
BnH	00H	mmH
BnH	20H	llH

n = MIDI channel number: 0H - FH (ch.1 - 16)
mm, ll = Bank number: 00 00H - 7F 7FH (bank.1 - bank.16384)

* Not received when the RX BANK SELECT parameter (System Parameter) is OFF.
* The Patches corresponding to each Bank Select are as follows.

BANK SELECT		PROGRAM NUMBER	GROUP	NUMBER
MSB	LSB			
087	000	001 - 128	User Patch	A-1 - H-8
	064	001 - 128	Preset Patch	A-1 - H-8
088	064	001 - 008	Preset PCM Patch	1 - 8

Modulation (Controller number 1)

Status	2nd byte	3rd byte
BnH	01H	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
vv = Modulation depth: 00H - 7FH (0 - 127)

Portamento Time (Controller number 5)

Status	2nd byte	3rd byte
BnH	05H	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
vv = Portamento Time: 00H - 7FH (0 - 127)

* PORTAMENTO TIME parameter (Patch Parameter) will change.

Volume (Controller number 7)

Status	2nd byte	3rd byte
BnH	07H	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
vv = Volume: 00H - 7FH (0 - 127)

Panpot (Controller number 10)

Status	2nd byte	3rd byte
BnH	0AH	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
vv = Panpot: 00H - 40H - 7FH (Left - Center - Right)

Expression (Controller number 11)

Status	2nd byte	3rd byte
BnH	0BH	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
vv = Expression: 00H - 7FH (0 - 127)

Hold 1 (Controller number 64)

Status	2nd byte	3rd byte
BnH	40H	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
vv = Control value: 00H - 7FH (0 - 127) 0-63 = OFF, 64-127 = ON

Program Change

Status	2nd byte
CnH	ppH

n = MIDI channel number: 0H - FH (ch.1 - 16)
pp = Program number: 00H - 7FH (prog.1 - prog.128)

* Not received when the RX PROGRAM CHANGE parameter (System Parameter) is OFF.

MIDI Implementation

● Pitch Bend Change

<u>Status</u>	<u>2nd byte</u>	<u>3rd byte</u>
EnH	llH	mmH

n = MIDI channel number: 0H - FH (ch.1 - 16)
mm, ll = Pitch Bend value: 00 00H - 40 00H - 7F 7FH (-8192 - 0 - +8191)

■ Channel Mode Messages

● All Sounds Off (Controller number 120)

<u>Status</u>	<u>2nd byte</u>	<u>3rd byte</u>
BnH	78H	00H

n = MIDI channel number: 0H - FH (ch.1 - 16)

* When this message is received, all notes currently sounding on the corresponding channel will be turned off.

● Reset All Controllers (Controller number 121)

<u>Status</u>	<u>2nd byte</u>	<u>3rd byte</u>
BnH	79H	00H

n = MIDI channel number: 0H - FH (ch.1 - 16)

* When this message is received, the following controllers will be set to their reset values.

<u>Controller</u>	<u>Reset value</u>
Pitch Bend Change	+/-0 (center)
Modulation	0 (off)
Expression	127 (max)
Hold 1	0 (off)

● All Notes Off (Controller number 123)

<u>Status</u>	<u>2nd byte</u>	<u>3rd byte</u>
BnH	7BH	00H

n = MIDI channel number: 0H - FH (ch.1 - 16)

* When All Notes Off is received, all notes on the corresponding channel will be turned off. However, if Hold 1 is ON, the sound will be continued until these are turned off.

● OMNI OFF (Controller number 124)

<u>Status</u>	<u>2nd byte</u>	<u>3rd byte</u>
BnH	7CH	00H

n = MIDI channel number: 0H - FH (ch.1 - 16)

* The same processing will be carried out as when All Notes Off is received.

● OMNI ON (Controller number 125)

<u>Status</u>	<u>2nd byte</u>	<u>3rd byte</u>
BnH	7DH	00H

n = MIDI channel number: 0H - FH (ch.1 - 16)

* The same processing will be carried out as when All Notes Off is received. OMNI ON will not be turned on.

● MONO (Controller number 126)

<u>Status</u>	<u>2nd byte</u>	<u>3rd byte</u>
BnH	7EH	mmH

n = MIDI channel number: 0H - FH (ch.1 - 16)
mm = mono number: 00H - 10H (0 - 16)

* The same processing will be carried out as when All Notes Off is received. MONO will not be turned on.

● POLY (Controller number 127)

<u>Status</u>	<u>2nd byte</u>	<u>3rd byte</u>
BnH	7FH	00H

n = MIDI channel number: 0H - FH (ch.1 - 16)

* The same processing will be carried out as when All Notes Off is received. MONO will not be turned off.

■ System Realtime Message

● Timing Clock

<u>Status</u>
F8H

* This is received when the CLOCK SOURCE parameter (System Parameter) is MIDI or USB.

● Active Sensing

Status
FEH

* When Active Sensing is received, the unit will begin monitoring the intervals of all further messages. While monitoring, if the interval between messages exceeds 420 ms, the same processing will be carried out as when All Sounds Off, All Notes Off and Reset All Controllers are received, and message interval monitoring will be halted.

■ System Exclusive Message

Status	Data byte	Status
F0H	iiH, ddH, .....eeH	F7H

F0H: System Exclusive Message status
 ii = ID number: An ID number (manufacturer ID) to indicate the manufacturer whose Exclusive message this is. Roland's manufacturer ID is 41H. ID numbers 7EH and 7FH are extensions of the MIDI standard; Universal Non-realtime Messages (7EH) and Universal Realtime Messages (7FH).
 dd,....,ee = data: 00H - 7FH (0 - 127)
 F7H: EOX (End Of Exclusive)

Of the System Exclusive messages received by this device, the Universal Non-realtime messages and the Universal Realtime messages and the Data Request (RQ1) messages and the Data Set (DT1) messages will be set automatically.

● Universal Non-realtime System Exclusive Messages

○ Identity Request Message

Status	Data byte	Status
F0H	7EH, dev, 06H, 01H	F7H

Byte	Explanation
F0H	Exclusive status
7EH	ID number (Universal Non-realtime Message)
dev	Device ID (dev: 10H - 1FH, 7FH)
06H	Sub ID#1 (General Information)
01H	Sub ID#2 (Identity Request)
F7H	EOX (End Of Exclusive)

* When this message is received, Identity Reply message (p. 7) will be transmitted.

○ GM1 System On

Status	Data byte	Status
F0H	7EH, 7FH, 09H, 01H	F7H

Byte	Explanation
F0H	Exclusive status
7EH	ID number (Universal Non-realtime Message)
7FH	Device ID (Broadcast)
09H	Sub ID#1 (General MIDI Message)
01H	Sub ID#2 (General MIDI 1 On)
F7H	EOX (End Of Exclusive)

○ GM2 System On

Status	Data byte	Status
F0H	7EH 7FH 09H 03H	F7H

Byte	Explanation
F0H	Exclusive status
7EH	ID number (Universal Non-realtime Message)
7FH	Device ID (Broadcast)
09H	Sub ID#1 (General MIDI Message)
03H	Sub ID#2 (General MIDI 2 On)
F7H	EOX (End Of Exclusive)

○ GM System Off

Status	Data byte	Status
F0H	7EH, 7F, 09H, 02H	F7H

Byte	Explanation
F0H	Exclusive status
7EH	ID number (Universal Non-realtime Message)
7FH	Device ID (Broadcast)
09H	Sub ID#1 (General MIDI Message)
02H	Sub ID#2 (General MIDI Off)
F7H	EOX (End Of Exclusive)

● Universal Realtime System Exclusive Messages

○ Master Volume

Status	Data byte	Status
F0H	7FH, 7FH, 04H, 01H, IIH, mmH	F7H

Byte	Explanation
F0H	Exclusive status
7FH	ID number (universal realtime message)
7FH	Device ID (Broadcast)
04H	Sub ID#1 (Device Control)
01H	Sub ID#2 (Master Volume)
IIH	Master Volume lower byte
mmH	Master Volume upper byte
F7H	EOX (End Of Exclusive)

- * The lower byte (IIH) of Master Volume will be handled as 00H.
- * The MASTER LEVEL parameter (System Parameter) will change.

○ Master Fine Tuning

Status	Data byte	Status
F0H	7FH, 7FH, 04H, 03H, IIH, mmH	F7H

Byte	Explanation
F0H	Exclusive status
7FH	ID number (universal realtime message)
7FH	Device ID (Broadcast)
04H	Sub ID#1 (Device Control)
03H	Sub ID#2 (Master Fine Tuning)
IIH	Master Fine Tuning LSB
mmH	Master Fine Tuning MSB
F7H	EOX (End Of Exclusive)

mm, II: 00 00H - 40 00H - 7F 7FH (-100 - 0 - +99.9 [cents])

- * The MASTER TUNE parameter (System Parameter) will change.

● Data Transmission

This instrument can use exclusive messages to exchange many varieties of internal settings with other devices.

The model ID of the exclusive messages used by this instrument is 00H 00H 41H.

○ Data Request 1 RQ1 (11H)

This message requests the other device to transmit data. The address and size indicate the type and amount of data that is requested.

When a Data Request message is received, if the device is in a state in which it is able to transmit data, and if the address and size are appropriate, the requested data is transmitted as a Data Set 1 (DT1) message. If the conditions are not met, nothing is transmitted.

status	data byte	status
F0H	41H, dev, 00H, 00H, 41H, 11H, aaH, bbH, ccH, ddH, ssH, ttH, uuH, vvH, sum	F7H

Byte	Remarks
F0H	Exclusive status
41H	ID number (Roland)
dev	device ID (dev: 10H - 1FH, 7FH)
00H	model ID #1 (SH-01)
00H	model ID #2 (SH-01)
41H	model ID #3 (SH-01)
11H	command ID (RQ1)
aaH	address MSB
bbH	address
ccH	address
ddH	address LSB
ssH	size MSB
ttH	size
uuH	size
vvH	size LSB
sum	checksum
F7H	EOX (End Of Exclusive)

- * The size of data that can be transmitted at one time is fixed for each type of data. And data requests must be made with a fixed starting address and size. Refer to the address and size given in "Parameter Address Map" (p. 8).

- * For the checksum, refer to (p. 20).

○ Data set 1 DT1 (12H)

Status	Data byte	Status
F0H	41H, dev, 00H, 00H, 41H, 12H, aaH, bbH, ccH, ddH, eeH, ... ffH, sum	F7H
Byte	Explanation	
F0H	Exclusive status	
41H	ID number (Roland)	
dev	Device ID (dev: 00H - 1FH, 7FH)	
00H	Model ID #1 (SH-01)	
00H	Model ID #2 (SH-01)	
41H	Model ID #3 (SH-01)	
12H	Command ID (DT1)	
aaH	Address MSB:	upper byte of the starting address of the data to be sent
bbH	Address:	upper middle byte of the starting address of the data to be sent
ccH	Address:	lower middle byte of the starting address of the data to be sent
ddH	Address LSB:	lower byte of the starting address of the data to be sent.
eeH	Data:	the actual data to be sent. Multiple bytes of data are transmitted in order starting from the address.
:	:	
ffH	Data	
sum	Checksum	
F7H	EOX (End Of Exclusive)	

- * The amount of data that can be transmitted at one time depends on the type of data, and data will be transmitted from the specified starting address and size. Refer to the address and size given in "Parameter Address Map" (p. 8).
- * Data larger than 256 bytes will be divided into packets of 256 bytes or less, and each packet will be sent at an interval of about 20 ms.
- * Regarding the checksum, please refer to (p. 20)

○ Data set 1 DT1 (12H)

Status	Data byte	Status
F0H	41H, dev, 42H, 12H, aaH, bbH, ccH, ddH, ... eeH, sum	F7H
Byte	Explanation	
F0H	Exclusive status	
41H	ID number (Roland)	
dev	Device ID (dev: 10H - 1FH, 7FH)	
42H	Model ID (GS)	
12H	Command ID (DT1)	
aaH	Address MSB:	upper byte of the starting address of the transmitted data
bbH	Address:	middle byte of the starting address of the transmitted data
ccH	Address LSB:	lower byte of the starting address of the transmitted data
ddH	Data:	the actual data to be transmitted. Multiple bytes of data are transmitted starting from the address.
:	:	
eeH	Data	
sum	Checksum	
F7H	EOX (End Of Exclusive)	

- * The amount of data that can be transmitted at one time depends on the type of data, and data will be transmitted from the specified starting address and size. Refer to the address and size given in "Parameter Address Map" (p. 8).
- * Data larger than 256 bytes will be divided into packets of 256 bytes or less, and each packet will be sent at an interval of about 20 ms.
- * Regarding the checksum, please refer to (p. 20)

2. Data Transmission

Channel Voice Messages

● Note off

Status	2nd byte	3rd byte
8nH	kkH	vvH
9nH	kkH	00H

n = MIDI channel number: 0H - FH (ch.1 - 16)
 kk = note number: 00H - 7FH (0 - 127)
 vv = note off velocity: 00H - 7FH (0 - 127)

● Note on

Status	2nd byte	3rd byte
9nH	kkH	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
 kk = note number: 00H - 7FH (0 - 127)
 vv = note on velocity: 01H - 7FH (1 - 127)

● Control Change

Status	2nd byte	3rd byte
BnH	kkH	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
 kk = Controller number: 00H - 77H (0 - 119)
 vv = Control value: 00H - 7FH (0 - 127)

○ Bank Select (Controller number 0, 32)

Status	2nd byte	3rd byte
BnH	00H	mmH
BnH	20H	llH

n = MIDI channel number: 0H - FH (ch.1 - 16)
 mm, ll = Bank number: 87 00H - 87 20H (bank.17281, bank.17313)

* These messages are transmitted when Patch is selected. But not transmitted when TX PROGRAM CHANGE or TX BANK SELECT parameter (SYSTEM COMMON MIDI) is OFF.

* The Patches corresponding to each Bank Select are as follows.

BANK SELECT		PROGRAM NUMBER	GROUP	NUMBER
MSB	LSB			
087	000	001 - 128	User Patch	A-1 - H-8
	064	001 - 128	Preset Patch	A-1 - H-8
088	064	001 - 008	Preset PCM Patch	1 - 8

○ Modulation (Controller number 1)

Status	2nd byte	3rd byte
BnH	01H	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
 vv = Modulation depth: 00H - 7FH (0 - 127)

○ Volume (Controller number 7)

Status	2nd byte	3rd byte
BnH	07H	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
 vv = Volume: 00H - 7FH (0 - 127)

○ Expression (Controller number 11)

Status	2nd byte	3rd byte
BnH	0BH	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
 vv = Expression: 00H - 7FH (0 - 127)

○ Hold 1 (Controller number 64)

Status	2nd byte	3rd byte
BnH	40H	vvH

n = MIDI channel number: 0H - FH (ch.1 - 16)
 vv = Control value: 00H - 7FH (0 - 127) 0-63 = OFF, 64-127 = ON

● Program Change

Status	2nd byte
CnH	ppH

n = MIDI channel number: 0H - FH (ch.1 - 16)
 pp = Program number: 00H - 7FH (prog.1 - prog.128)

● Pitch Bend Change

Status	2nd byte	3rd byte
EnH	llH	mmH

n = MIDI channel number: 0H - FH (ch.1 - 16)
 mm, ll = Pitch Bend value: 00 00H - 40 00H - 7F 7FH (-8192 - 0 - +8191)

System Realtime Messages

● Active Sensing

Status
FEH

* This message is transmitted at intervals of approximately 250 msec.

System Exclusive Message

Status	Data byte	Status
F0H	iiH, ddH, .....eeH	F7H
F0H:	System Exclusive Message status	
ii = ID number:	An ID number (manufacturer ID) to indicate the manufacturer whose Exclusive message this is. Roland's manufacturer ID is 41H. ID numbers 7EH and 7FH are extensions of the MIDI standard; Universal Non-realtime Messages (7EH) and Universal Realtime Messages (7FH).	
dd,....,ee = data:	00H - 7FH (0 - 127)	
F7H:	EOX (End Of Exclusive)	

Universal Non-realtime System Exclusive Messages and Data Set 1 (DT1) are the only System Exclusive messages transmitted by the SH-01.

Universal Non-realtime System Exclusive Message

Identity Reply Message (SH-01)

Receiving Identity Request Message, the SH-01 send this message.

Status	Data byte	Status
F0H	7EH, dev, 06H, 02H, 41H, 41H, 02H, 00H, 00H, 00H, 03H, 00H, 00H	F7H

Byte	Explanation
F0H	Exclusive status
7EH	ID number (Universal Non-realtime Message)
dev	Device ID (dev: 10H - 1FH)
06H	Sub ID#1 (General Information)
02H	Sub ID#2 (Identity Reply)
41H	ID number (Roland)
41H 02H	Device family code
00H 00H	Device family number code
00H 03H 00H 00H	Software revision level
F7H	EOX (End of Exclusive)

Data Transmission

Data set 1 DT1 (12H)

Status	Data byte	Status
F0H	41H, dev, 00H, 00H, 41H, 12H, aaH, bbH, ccH, ddH, eeH, ... ffH, sum	F7H

Byte	Explanation
F0H	Exclusive status
41H	ID number (Roland)
dev	Device ID (dev: 00H - 1FH, 7FH)
00H	Model ID #1 (SH-01)
00H	Model ID #2 (SH-01)
41H	Model ID #3 (SH-01)
12H	Command ID (DT1)
aaH	Address MSB: upper byte of the starting address of the data to be sent
bbH	Address: upper middle byte of the starting address of the data to be sent
ccH	Address: lower middle byte of the starting address of the data to be sent
ddH	Address LSB: lower byte of the starting address of the data to be sent.
eeH	Data: the actual data to be sent. Multiple bytes of data are transmitted in order starting from the address.
:	:
ffH	Data
sum	Checksum
F7H	EOX (End Of Exclusive)

* The amount of data that can be transmitted at one time depends on the type of data, and data will be transmitted from the specified starting address and size. Refer to the address and size given in "Parameter Address Map" (p. 8).

* Data larger than 256 bytes will be divided into packets of 256 bytes or less, and each packet will be sent at an interval of about 20 ms.

3. Parameter Address Map

* Transmission of “#” marked address is divided to some packets. For example, ABH in hexadecimal notation will be divided to 0AH and 0BH, and is sent/received in this order.

1. SH-01 (ModelID = 00H 00H 41H)

Start Address	Description
01 00 00 00	System
10 00 00 00	Temporary Patch
20 00 00 00	User Patch (A-1)
20 01 00 00	User Patch (A-2)
:	:
20 3F 00 00	User Patch (H-8)

* Patch

Offset Address	Description
00 00 00	Patch Common
00 01 00	Patch Tone 1
00 02 00	Patch Tone 2
00 03 00	Patch Tone 3
00 04 00	Patch Distortion
00 06 00	Patch Flanger
00 08 00	Patch Delay
00 0A 00	Patch Reverb
00 0C 00	Patch Arpeggio Common
00 0D 00	Patch Arpeggio Pattern (Note 1)
00 0E 00	Patch Arpeggio Pattern (Note 2)
:	:
00 1C 00	Patch Arpeggio Pattern (Note 16)

* System

Offset Address	Description
00 00	0aaa aaaa | Bank Select MSB (CC# 0) (0 - 127)
00 01	0aaa aaaa | Bank Select LSB (CC# 32) (0 - 127)
00 02	0aaa aaaa | Program Number (PC) (0 - 127)
00 03	0aaa aaaa | Master Level (0 - 127)
# 00 04	0000 aaaa | 0000 bbbb | 0000 cccc | 0000 dddd | Master Tune (24 - 2024)
00 08	0000 000a | Patch Remain -100.0 - 100.0 [cent] (0 - 1) OFF, ON
00 09	0000 00aa | Clock Source (0 - 3) PATCH, SYSTEM, MIDI, USB
# 00 0A	0000 aaaa | 0000 bbbb | 0000 cccc | System Tempo (5 - 300) 5 - 300 [BPM]
00 0D	0aaa aaaa | Keyboard Velocity (0 - 1) REAL, FIX
00 0E	0000 000a | Pedal Polarity (0 - 1) STANDARD, REVERSE
00 0F	0000 0aaa | Pedal Assign (0 - 6) HOLD, MODULATION, VOLUME, EXPRESSION, BEND-MODE, D-BEAM-SYNC, TAP-TEMPO
00 10	0000 aaaa | D Beam Sens (1 - 8)
00 11	0000 aaaa | Rx/Tx Channel (0 - 15) 1 - 16
00 12	0000 000a | MIDI-USB Thru (0 - 1) OFF, ON
00 13	0000 000a | Soft Thru (0 - 1) OFF, ON
00 14	0000 000a | Rx Program Change (0 - 1) OFF, ON
00 15	0000 000a | Rx Bank Select (0 - 1) OFF, ON
00 16	0000 000a | Remote Keyboard (0 - 1) OFF, ON
00 17	0000 000a | Tx Program Change (0 - 1) OFF, ON
00 18	0000 000a | Tx Bank Select (0 - 1) OFF, ON
00 19	0000 000a | Tx Edit Data (0 - 1) OFF, ON
00 1A	0000 000a | Recorder Sync Output (0 - 1) OFF, ON

00 1B	0000 0aaa	Recorder Metronome Mode	(0 - 3)
		OFF, REC-ONLY, REC&PLAY, ALWAYS	
00 1C	0000 0aaa	Recorder Metronome Level	(0 - 7)
00 1D	0000 0aaa	(reserved)	(0 - 1)
00 1E	0aaa aaaa	(reserved)	(0 - 127)
00 1F	0aaa aaaa	(reserved)	(0 - 127)
00 20	0000 000a	(reserved)	(0 - 1)
00 21	0000 aaaa	(reserved)	(59 - 70)
			-5 - +6
00 22	0000 0aaa	(reserved)	(61 - 67)
			-3 - +3
00 23	0aaa aaaa	(reserved)	(0 - 127)
00 24	0000 000a	(reserved)	(0 - 1)
00 25	0000 000a	(reserved)	(0 - 1)
00 26	0000 000a	(reserved)	(0 - 1)
00 27	0000 000a	(reserved)	(0 - 1)
00 28	0aaa aaaa	(reserved)	(0 - 127)
00 29	0aaa aaaa	(reserved)	(0 - 127)
00 2A	0aaa aaaa	(reserved)	(1 - 127)
			-63 - +63
00 2B	0000 000a	Write Protect A-1	(0 - 1)
		OFF, ON	
00 2C	0000 000a	Write Protect A-2	(0 - 1)
		OFF, ON	
00 2D	0000 000a	Write Protect A-3	(0 - 1)
		OFF, ON	
00 2E	0000 000a	Write Protect A-4	(0 - 1)
		OFF, ON	
00 2F	0000 000a	Write Protect A-5	(0 - 1)
		OFF, ON	
00 30	0000 000a	Write Protect A-6	(0 - 1)
		OFF, ON	
00 31	0000 000a	Write Protect A-7	(0 - 1)
		OFF, ON	
00 32	0000 000a	Write Protect A-8	(0 - 1)
		OFF, ON	
00 33	0000 000a	Write Protect B-1	(0 - 1)
		OFF, ON	
00 34	0000 000a	Write Protect B-2	(0 - 1)
		OFF, ON	
00 35	0000 000a	Write Protect B-3	(0 - 1)
		OFF, ON	
00 36	0000 000a	Write Protect B-4	(0 - 1)
		OFF, ON	
00 37	0000 000a	Write Protect B-5	(0 - 1)
		OFF, ON	
00 38	0000 000a	Write Protect B-6	(0 - 1)
		OFF, ON	
00 39	0000 000a	Write Protect B-7	(0 - 1)
		OFF, ON	
00 3A	0000 000a	Write Protect B-8	(0 - 1)
		OFF, ON	
00 3B	0000 000a	Write Protect C-1	(0 - 1)
		OFF, ON	
00 3C	0000 000a	Write Protect C-2	(0 - 1)
		OFF, ON	
00 3D	0000 000a	Write Protect C-3	(0 - 1)
		OFF, ON	
00 3E	0000 000a	Write Protect C-4	(0 - 1)
		OFF, ON	
00 3F	0000 000a	Write Protect C-5	(0 - 1)
		OFF, ON	
00 40	0000 000a	Write Protect C-6	(0 - 1)
		OFF, ON	
00 41	0000 000a	Write Protect C-7	(0 - 1)
		OFF, ON	
00 42	0000 000a	Write Protect C-8	(0 - 1)
		OFF, ON	
00 43	0000 000a	Write Protect D-1	(0 - 1)
		OFF, ON	
00 44	0000 000a	Write Protect D-2	(0 - 1)
		OFF, ON	
00 45	0000 000a	Write Protect D-3	(0 - 1)
		OFF, ON	
00 46	0000 000a	Write Protect D-4	(0 - 1)
		OFF, ON	
00 47	0000 000a	Write Protect D-5	(0 - 1)
		OFF, ON	
00 48	0000 000a	Write Protect D-6	(0 - 1)
		OFF, ON	
00 49	0000 000a	Write Protect D-7	(0 - 1)
		OFF, ON	
00 4A	0000 000a	Write Protect D-8	(0 - 1)
		OFF, ON	
00 4B	0000 000a	Write Protect E-1	(0 - 1)
		OFF, ON	
00 4C	0000 000a	Write Protect E-2	(0 - 1)
		OFF, ON	
00 4D	0000 000a	Write Protect E-3	(0 - 1)
		OFF, ON	
00 4E	0000 000a	Write Protect E-4	(0 - 1)
		OFF, ON	
00 4F	0000 000a	Write Protect E-5	(0 - 1)
		OFF, ON	
00 50	0000 000a	Write Protect E-6	(0 - 1)
		OFF, ON	

MIDI Implementation

00 51	0000 000a	Write Protect E-7	(0 - 1) OFF, ON
00 52	0000 000a	Write Protect E-8	(0 - 1) OFF, ON
00 53	0000 000a	Write Protect F-1	(0 - 1) OFF, ON
00 54	0000 000a	Write Protect F-2	(0 - 1) OFF, ON
00 55	0000 000a	Write Protect F-3	(0 - 1) OFF, ON
00 56	0000 000a	Write Protect F-4	(0 - 1) OFF, ON
00 57	0000 000a	Write Protect F-5	(0 - 1) OFF, ON
00 58	0000 000a	Write Protect F-6	(0 - 1) OFF, ON
00 59	0000 000a	Write Protect F-7	(0 - 1) OFF, ON
00 5A	0000 000a	Write Protect F-8	(0 - 1) OFF, ON
00 5B	0000 000a	Write Protect G-1	(0 - 1) OFF, ON
00 5C	0000 000a	Write Protect G-2	(0 - 1) OFF, ON
00 5D	0000 000a	Write Protect G-3	(0 - 1) OFF, ON
00 5E	0000 000a	Write Protect G-4	(0 - 1) OFF, ON
00 5F	0000 000a	Write Protect G-5	(0 - 1) OFF, ON
00 60	0000 000a	Write Protect G-6	(0 - 1) OFF, ON
00 61	0000 000a	Write Protect G-7	(0 - 1) OFF, ON
00 62	0000 000a	Write Protect G-8	(0 - 1) OFF, ON
00 63	0000 000a	Write Protect H-1	(0 - 1) OFF, ON
00 64	0000 000a	Write Protect H-2	(0 - 1) OFF, ON
00 65	0000 000a	Write Protect H-3	(0 - 1) OFF, ON
00 66	0000 000a	Write Protect H-4	(0 - 1) OFF, ON
00 67	0000 000a	Write Protect H-5	(0 - 1) OFF, ON
00 68	0000 000a	Write Protect H-6	(0 - 1) OFF, ON
00 69	0000 000a	Write Protect H-7	(0 - 1) OFF, ON
00 6A	0000 000a	Write Protect H-8	(0 - 1) OFF, ON
00 6B	0000 aaaa	Power Save Mode OFF, 1, 3, 5, 10, 20, 30, 60 [min]	(0 - 7)
00 6C	0aaa aaaa	(reserved)	(0 - 15)
00 6D	0aaa aaaa	(reserved)	(0 - 16)
00 00 00 6E		Total Size	

*Patch Common

Offset Address	Description	
00 00	0aaa aaaa	Patch Name 1 (32 - 127) 32 - 127 [ASCII]
00 01	0aaa aaaa	Patch Name 2 (32 - 127) 32 - 127 [ASCII]
00 02	0aaa aaaa	Patch Name 3 (32 - 127) 32 - 127 [ASCII]
00 03	0aaa aaaa	Patch Name 4 (32 - 127) 32 - 127 [ASCII]
00 04	0aaa aaaa	Patch Name 5 (32 - 127) 32 - 127 [ASCII]
00 05	0aaa aaaa	Patch Name 6 (32 - 127) 32 - 127 [ASCII]
00 06	0aaa aaaa	Patch Name 7 (32 - 127) 32 - 127 [ASCII]
00 07	0aaa aaaa	Patch Name 8 (32 - 127) 32 - 127 [ASCII]
00 08	0aaa aaaa	Patch Name 9 (32 - 127) 32 - 127 [ASCII]
00 09	0aaa aaaa	Patch Name 10 (32 - 127) 32 - 127 [ASCII]
00 0A	0aaa aaaa	Patch Name 11 (32 - 127) 32 - 127 [ASCII]
00 0B	0aaa aaaa	Patch Name 12 (32 - 127) 32 - 127 [ASCII]
00 0C	0aaa aaaa	Patch Level (0 - 127)
# 00 0D	0000 aaaa 0000 bbbb 0000 cccc	Patch Tempo (5 - 300) 5 - 300 [BPM]
00 10	0000 000a	Arpeggio Switch (0 - 1) OFF, ON

00 11	0000 000a	(reserved)	(0 - 1)
00 12	0000 000a	Portamento Switch	(0 - 1) OFF, ON
00 13	0aaa aaaa	Portamento Time	(0 - 127)
00 14	0000 00aa	Mono Switch	(0 - 1) OFF, ON
00 15	0000 0aaa	Octave Shift	(61 - 67) -3 - +3
00 16	000a aaaa	Pitch Bend Range Up	(0 - 24)
00 17	000a aaaa	Pitch Bend Range Down	(0 - 24)
00 18	0000 0aaa	(reserved)	(0 - 1)
00 19	0000 000a	Tone1 Switch	(0 - 1) OFF, ON
00 1A	0000 000a	Tone1 Select	(0 - 1) OFF, ON
00 1B	0000 000a	Tone2 Switch	(0 - 1) OFF, ON
00 1C	0000 000a	Tone2 Select	(0 - 1) OFF, ON
00 1D	0000 000a	Tone3 Switch	(0 - 1) OFF, ON
00 1E	0000 000a	Tone3 Select	(0 - 1) OFF, ON
00 1F	0000 00aa	SYNC/RING Select	(0 - 2) OFF, SYNC, RING
00 20	0000 000a	Effects Master Switch	(0 - 1) OFF, ON
00 21	0000 00aa	(reserved)	(0 - 3)
00 22	0000 000a	Delay Tempo Sync Switch	(0 - 1) OFF, ON
00 23	0000 000a	Low Boost Switch	(0 - 1) OFF, ON
00 24	00aa aaaa	D Beam Assign	(0 - 29) LFO-RATE, LFO-FADE-TIME, LFO-PITCH-MOD, LFO-FILTER-MOD, LFO-AMP-MOD, OSC-PITCH, OSC-DETUNE, OSC-PWM, OSC-PW, OSC-ENV-A, OSC-ENV-D, OSC-ENV-MOD, FILTER-CUTOFF, FILTER-RESONANCE, FILTER-ENV-A, FILTER-ENV-D, FILTER-ENV-S, FILTER-ENV-R, FILTER-ENV-MOD, AMP-LEVEL, AMP-ENV-A, AMP-ENV-D, AMP-ENV-S, AMP-ENV-R, EFX-CTRL, PORT-TIME, BENDER, MODULATION, FILTER-CUTOFF-KF, EFX-LEVEL
00 25	0000 000a	(reserved)	(0 - 1)
00 26	0000 000a	(reserved)	(0 - 1)
00 27	0000 000a	(reserved)	(0 - 1)
00 28	0000 000a	(reserved)	(0 - 1)
00 29	0000 000a	D Beam Polarity	(0 - 1) NORMAL, REVERSE
00 2A	0000 000a	Effects Distortion Select	(0 - 1) OFF, ON
00 2B	0000 000a	Effects Flanger Select	(0 - 1) OFF, ON
00 2C	0000 000a	Effects Delay Select	(0 - 1) OFF, ON
00 2D	0000 000a	Effects Reverb Select	(0 - 1) OFF, ON
00 2E	0000 000a	(reserved)	(0 - 1)
00 2F	0000 000a	(reserved)	(0 - 1)
00 30	0000 000a	(reserved)	(0 - 1)
00 31	0000 000a	(reserved)	(0 - 1)
00 32	0000 000a	(reserved)	(0 - 1)
00 33	0000 000a	(reserved)	(0 - 1)
00 34	0aaa aaaa	(reserved)	(0 - 127)
00 35	0aaa aaaa	(reserved)	(0 - 127)
00 36	0aaa aaaa	(reserved)	(0 - 127)
00 37	0aaa aaaa	(reserved)	(0 - 127)
00 38	0aaa aaaa	(reserved)	(0 - 127)
00 39	0aaa aaaa	(reserved)	(0 - 127)
00 3A	0aaa aaaa	(reserved)	(1 - 127) -63 - +63
00 3B	0aaa aaaa	(reserved)	(1 - 127) -63 - +63
00 3C	0aaa aaaa	(reserved)	(1 - 127) -63 - +63
00 00 00 3D	Total Size		

* Patch Tone

Offset	Address	Description	
00 00	0000 0aaa	OSC Wave	(0 - 6) SAW, SQR, PW-SQR, TRI, SINE, NOISE, SUPER-SAW
00 01	00aa aaaa	OSC Wave Variation	(0 - 2) A, B, C
00 02	0000 00aa	(reserved)	(0 - 1) OFF, ON
00 03	00aa aaaa	OSC Pitch	(40 - 88) -24 - +24

MIDI Implementation

00 04	0aaa aaaa	OSC Detune	(14 - 114)
			-50 - +50
00 05	0aaa aaaa	OSC Pulse Width Mod Depth	(0 - 127)
00 06	0aaa aaaa	OSC Pulse Width	(0 - 127)
00 07	0aaa aaaa	OSC Pitch Env Attack Time	(0 - 127)
00 08	0aaa aaaa	OSC Pitch Env Decay	(0 - 127)
00 09	0aaa aaaa	OSC Pitch Env Depth	(1 - 127)
			-63 - +63

00 0A	0000 0aaa	FILTER Mode	(0 - 4)
		BYPASS, LPF, HPF, BPF, PKG	
00 0B	0000 000a	FILTER Slope	(0 - 1)
			-12, -24 [dB]
00 0C	0aaa aaaa	FILTER Cutoff	(0 - 127)
00 0D	00aa aaaa	FILTER Cutoff Keyfollow	(54 - 74)
			-100 - +100
00 0E	0aaa aaaa	FILTER Env Velocity Sens	(1 - 127)
			-63 - +63
00 0F	0aaa aaaa	FILTER Resonance	(0 - 127)
00 10	0aaa aaaa	FILTER Env Attack Time	(0 - 127)
00 11	0aaa aaaa	FILTER Env Decay Time	(0 - 127)
00 12	0aaa aaaa	FILTER Env Sustain Level	(0 - 127)
00 13	0aaa aaaa	FILTER Env Release Time	(0 - 127)
00 14	0aaa aaaa	FILTER Env Depth	(1 - 127)
			-63 - +63

00 15	0aaa aaaa	AMP Level	(0 - 127)
00 16	0aaa aaaa	AMP Level Velocity Sens	(1 - 127)
			-63 - +63
00 17	0aaa aaaa	AMP Env Attack Time	(0 - 127)
00 18	0aaa aaaa	AMP Env Decay Time	(0 - 127)
00 19	0aaa aaaa	AMP Env Sustain Level	(0 - 127)
00 1A	0aaa aaaa	AMP Env Release Time	(0 - 127)
00 1B	0aaa aaaa	AMP Pan	(0 - 127)
			L64 - 63R

00 1C	0000 0aaa	LFO Shape	(0 - 5)
		TRI, SIN, SAW, SQR, S&H, RND	
00 1D	0aaa aaaa	LFO Rate	(0 - 127)
00 1E	0000 000a	LFO Tempo Sync Switch	(0 - 1)
			OFF, ON
00 1F	000a aaaa	LFO Tempo Sync Note	(0 - 19)
		16, 12, 8, 4, 2, 1, 3/4, 2/3, 1/2,	
		3/8, 1/3, 1/4, 3/16, 1/6, 1/8, 3/32,	
		1/12, 1/16, 1/24, 1/32	
00 20	0aaa aaaa	LFO Fade Time	(0 - 127)
00 21	0000 000a	LFO Key Trigger	(0 - 1)
			OFF, ON
00 22	0aaa aaaa	LFO Pitch Depth	(1 - 127)
			-63 - +63
00 23	0aaa aaaa	LFO Filter Depth	(1 - 127)
			-63 - +63
00 24	0aaa aaaa	LFO Amp Depth	(1 - 127)
			-63 - +63
00 25	0aaa aaaa	LFO Pan Depth	(1 - 127)
			-63 - +63

00 26	0000 0aaa	Modulation LFO Shape	(0 - 5)
		TRI, SIN, SAW, SQR, S&H, RND	
00 27	0aaa aaaa	Modulation LFO Rate	(0 - 127)
00 28	0000 000a	Modulation LFO Tempo Sync Switch	(0 - 1)
			OFF, ON
00 29	000a aaaa	Modulation LFO Tempo Sync Note	(0 - 19)
		16, 12, 8, 4, 2, 1, 3/4, 2/3, 1/2,	
		3/8, 1/3, 1/4, 3/16, 1/6, 1/8, 3/32,	
		1/12, 1/16, 1/24, 1/32	
00 2A	0aaa aaaa	(reserved)	(0 - 127)
00 2B	0000 000a	(reserved)	(0 - 1)
00 2C	0aaa aaaa	Modulation LFO Pitch Depth	(1 - 127)
			-63 - +63
00 2D	0aaa aaaa	Modulation LFO Filter Depth	(1 - 127)
			-63 - +63
00 2E	0aaa aaaa	Modulation LFO Amp Depth	(1 - 127)
			-63 - +63
00 2F	0aaa aaaa	Modulation LFO Pan Depth	(1 - 127)
			-63 - +63

00 30	0aaa aaaa	(reserved)	(1 - 127)
			-63 - +63
00 31	0aaa aaaa	(reserved)	(1 - 127)
			-63 - +63
00 32	0aaa aaaa	(reserved)	(1 - 127)
			-63 - +63
00 33	0aaa aaaa	(reserved)	(1 - 127)
			-63 - +63

00 34	0000 000a	(reserved)	(0 - 1)
00 35	0000 000a	(reserved)	(0 - 1)
00 36	0000 000a	(reserved)	(0 - 1)
00 37	0000 000a	(reserved)	(0 - 1)
00 38	0aaa aaaa	(reserved)	(0 - 127)
00 39	0aaa aaaa	(reserved)	(0 - 127)
00 3A	0aaa aaaa	(reserved)	(0 - 127)
00 3B	0aaa aaaa	(reserved)	(0 - 127)
00 3C	0aaa aaaa	(reserved)	(1 - 127)
			-63 - +63
00 3D	0aaa aaaa	(reserved)	(1 - 127)
			-63 - +63

00 00 00 3E		Total Size	

* Patch Distortion

Offset	Address	Description
00 00	0aaa aaaa	Distortion Type (0 - 3) OFF, DIST, FUZZ, BIT CRASH
# 00 01	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 1 (12768 - 52768) -20000 - +20000
# 00 05	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 2 (12768 - 52768) -20000 - +20000
# 00 09	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 3 (12768 - 52768) -20000 - +20000
# 00 0D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 4 (12768 - 52768) -20000 - +20000
# 00 11	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 5 (12768 - 52768) -20000 - +20000
# 00 15	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 6 (12768 - 52768) -20000 - +20000
# 00 19	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 7 (12768 - 52768) -20000 - +20000
# 00 1D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 8 (12768 - 52768) -20000 - +20000
# 00 21	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 9 (12768 - 52768) -20000 - +20000
# 00 25	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 10 (12768 - 52768) -20000 - +20000
# 00 29	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 11 (12768 - 52768) -20000 - +20000
# 00 2D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 12 (12768 - 52768) -20000 - +20000
# 00 31	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 13 (12768 - 52768) -20000 - +20000
# 00 35	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 14 (12768 - 52768) -20000 - +20000
# 00 39	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 15 (12768 - 52768) -20000 - +20000
# 00 3D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 16 (12768 - 52768) -20000 - +20000
# 00 41	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 17 (12768 - 52768) -20000 - +20000
# 00 45	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 18 (12768 - 52768) -20000 - +20000
# 00 49	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 19 (12768 - 52768) -20000 - +20000

MIDI Implementation

#	00 4D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 20	(12768 - 52768) -20000 - +20000
#	00 51	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 21	(12768 - 52768) -20000 - +20000
#	00 55	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 22	(12768 - 52768) -20000 - +20000
#	00 59	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 23	(12768 - 52768) -20000 - +20000
#	00 5D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 24	(12768 - 52768) -20000 - +20000
#	00 61	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 25	(12768 - 52768) -20000 - +20000
#	00 65	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 26	(12768 - 52768) -20000 - +20000
#	00 69	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 27	(12768 - 52768) -20000 - +20000
#	00 6D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 28	(12768 - 52768) -20000 - +20000
#	00 71	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 29	(12768 - 52768) -20000 - +20000
#	00 75	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 30	(12768 - 52768) -20000 - +20000
#	00 79	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 31	(12768 - 52768) -20000 - +20000
#	00 7D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	MFX Parameter 32	(12768 - 52768) -20000 - +20000

	00 00 01 01	Total Size		

* Patch Flanger

Offset	Address	Description		
	00 00	0aaa aaaa	Flanger Type	(0 - 3) OFF, FLANGER, PHASER, PITCH SHIFTER
#	00 01	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Flanger Parameter 1	(12768 - 52768) -20000 - +20000
#	00 05	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Flanger Parameter 2	(12768 - 52768) -20000 - +20000
#	00 09	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Flanger Parameter 3	(12768 - 52768) -20000 - +20000
#	00 0D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Flanger Parameter 4	(12768 - 52768) -20000 - +20000
#	00 11	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Flanger Parameter 5	(12768 - 52768) -20000 - +20000

#	00 15	0000 aaaa	Flanger Parameter 6	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000
#	00 19	0000 aaaa	Flanger Parameter 7	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000
#	00 1D	0000 aaaa	Flanger Parameter 8	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000
#	00 21	0000 aaaa	Flanger Parameter 9	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000
#	00 25	0000 aaaa	Flanger Parameter 10	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000
#	00 29	0000 aaaa	Flanger Parameter 11	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000
#	00 2D	0000 aaaa	Flanger Parameter 12	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000
#	00 31	0000 aaaa	Flanger Parameter 13	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000
#	00 35	0000 aaaa	Flanger Parameter 14	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000
#	00 39	0000 aaaa	Flanger Parameter 15	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000
#	00 3D	0000 aaaa	Flanger Parameter 16	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000
#	00 41	0000 aaaa	Flanger Parameter 17	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000
#	00 45	0000 aaaa	Flanger Parameter 18	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000
#	00 49	0000 aaaa	Flanger Parameter 19	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000
#	00 4D	0000 aaaa	Flanger Parameter 20	(12768 - 52768)
		0000 bbbb		
		0000 cccc		
		0000 dddd			-20000 - +20000

	00 00 00 51	Total Size		

* Patch Delay

Offset	Address	Description
00 00	0aaa aaaa	Delay Type (0 - 2) OFF, DELAY, PANNING DELAY
#	00 01	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd Delay Parameter 1 (12768 - 52768) -20000 - +20000
#	00 05	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd Delay Parameter 2 (12768 - 52768) -20000 - +20000
#	00 09	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd Delay Parameter 3 (12768 - 52768) -20000 - +20000

MIDI Implementation

#	00 0D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 4	(12768 - 52768) -20000 - +20000
#	00 11	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 5	(12768 - 52768) -20000 - +20000
#	00 15	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 6	(12768 - 52768) -20000 - +20000
#	00 19	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 7	(12768 - 52768) -20000 - +20000
#	00 1D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 8	(12768 - 52768) -20000 - +20000
#	00 21	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 9	(12768 - 52768) -20000 - +20000
#	00 25	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 10	(12768 - 52768) -20000 - +20000
#	00 29	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 11	(12768 - 52768) -20000 - +20000
#	00 2D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 12	(12768 - 52768) -20000 - +20000
#	00 31	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 13	(12768 - 52768) -20000 - +20000
#	00 35	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 14	(12768 - 52768) -20000 - +20000
#	00 39	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 15	(12768 - 52768) -20000 - +20000
#	00 3D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 16	(12768 - 52768) -20000 - +20000
#	00 41	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 17	(12768 - 52768) -20000 - +20000
#	00 45	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 18	(12768 - 52768) -20000 - +20000
#	00 49	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 19	(12768 - 52768) -20000 - +20000
#	00 4D	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Delay Parameter 20	(12768 - 52768) -20000 - +20000

	00 00 00 51	Total Size		

* Patch Reverb

Offset	Address	Description	
	00 00	0aaa aaaa	Reverb Type (0 - 1) OFF, REVERB
#	00 01	0000 aaaa 0000 bbbb 0000 cccc 0000 dddd	Reverb Parameter 1 (12768 - 52768) -20000 - +20000


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|# 00 05 | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 2          (12768 - 52768)
|         |           | -20000 - +20000
|# 00 09 | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 3          (12768 - 52768)
|         |           | -20000 - +20000
|# 00 0D | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 4          (12768 - 52768)
|         |           | -20000 - +20000
|# 00 11 | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 5          (12768 - 52768)
|         |           | -20000 - +20000
|# 00 15 | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 6          (12768 - 52768)
|         |           | -20000 - +20000
|# 00 19 | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 7          (12768 - 52768)
|         |           | -20000 - +20000
|# 00 1D | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 8          (12768 - 52768)
|         |           | -20000 - +20000
|# 00 21 | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 9          (12768 - 52768)
|         |           | -20000 - +20000
|# 00 25 | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 10         (12768 - 52768)
|         |           | -20000 - +20000
|# 00 29 | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 11         (12768 - 52768)
|         |           | -20000 - +20000
|# 00 2D | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 12         (12768 - 52768)
|         |           | -20000 - +20000
|# 00 31 | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 13         (12768 - 52768)
|         |           | -20000 - +20000
|# 00 35 | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 14         (12768 - 52768)
|         |           | -20000 - +20000
|# 00 39 | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 15         (12768 - 52768)
|         |           | -20000 - +20000
|# 00 3D | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 16         (12768 - 52768)
|         |           | -20000 - +20000
|# 00 41 | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 17         (12768 - 52768)
|         |           | -20000 - +20000
|# 00 45 | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 18         (12768 - 52768)
|         |           | -20000 - +20000
|# 00 49 | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 19         (12768 - 52768)
|         |           | -20000 - +20000
|# 00 4D | 0000 aaaa |
|         | 0000 bbbb |
|         | 0000 cccc |
|         | 0000 dddd | Reverb Parameter 20         (12768 - 52768)
|         |           | -20000 - +20000
|-----|-----|-----|-----|-----|
| 00 00 00 51 | Total Size

```

MIDI Implementation

* Patch Arpeggio Common

Offset Address	Description
00 00 | 0aaa aaaa	Arpeggio Grid (0 - 8) 04_, 08_, 08L, 08H, 08t, 16_, 16L, 16H, 16t
00 01 | 0aaa aaaa	Arpeggio Duration (0 - 9) 30, 40, 50, 60, 70, 80, 90, 100, 120, FUL
00 02 | 0aaa aaaa	Arpeggio Motif (0 - 11) UP/L, UP/L&H, UP/_, DOWN/L, DOWN/L&H, DOWN/_, UP&DOWN/L, UP&DOWN/L&H, UP&DOWN/_, RANDOM/L, RANDOM/_ , PHRASE
00 03 | 0000 0aaa	Arpeggio Octave Range (61 - 67) -3 - +3
00 04 | 0aaa aaaa	Arpeggio Accent Rate (0 - 100)
00 05 | 0aaa aaaa	Arpeggio Velocity (0 - 127) REAL, 1 - 127
# 00 06 | 0000 aaaa	End Step (1 - 32)
| 0000 bbbb	
00 00 00 08 |	Total Size

* Patch Arpeggio Pattern

Offset Address	Description
# 00 00 | 0000 aaaa	Original Note (0 - 128)
| 0000 bbbb	
# 00 02 | 0000 aaaa	Step1 Data (0 - 128)
| 0000 bbbb	
# 00 04 | 0000 aaaa	Step2 Data (0 - 128)
| 0000 bbbb	
# 00 06 | 0000 aaaa	Step3 Data (0 - 128)
| 0000 bbbb	
# 00 08 | 0000 aaaa	Step4 Data (0 - 128)
| 0000 bbbb	
# 00 0A | 0000 aaaa	Step5 Data (0 - 128)
| 0000 bbbb	
# 00 0C | 0000 aaaa	Step6 Data (0 - 128)
| 0000 bbbb	
# 00 0E | 0000 aaaa	Step7 Data (0 - 128)
| 0000 bbbb	
# 00 10 | 0000 aaaa	Step8 Data (0 - 128)
| 0000 bbbb	
# 00 12 | 0000 aaaa	Step9 Data (0 - 128)
| 0000 bbbb	
# 00 14 | 0000 aaaa	Step10 Data (0 - 128)
| 0000 bbbb	
# 00 16 | 0000 aaaa	Step11 Data (0 - 128)
| 0000 bbbb	
# 00 18 | 0000 aaaa	Step12 Data (0 - 128)
| 0000 bbbb	
# 00 1A | 0000 aaaa	Step13 Data (0 - 128)
| 0000 bbbb	
# 00 1C | 0000 aaaa	Step14 Data (0 - 128)
| 0000 bbbb	
# 00 1E | 0000 aaaa	Step15 Data (0 - 128)
| 0000 bbbb	
# 00 20 | 0000 aaaa	Step16 Data (0 - 128)
| 0000 bbbb	
# 00 22 | 0000 aaaa	Step17 Data (0 - 128)
| 0000 bbbb	
# 00 24 | 0000 aaaa	Step18 Data (0 - 128)
| 0000 bbbb	
# 00 26 | 0000 aaaa	Step19 Data (0 - 128)
| 0000 bbbb	
# 00 28 | 0000 aaaa	Step20 Data (0 - 128)
| 0000 bbbb	
# 00 2A | 0000 aaaa	Step21 Data (0 - 128)
| 0000 bbbb	
# 00 2C | 0000 aaaa	Step22 Data (0 - 128)
| 0000 bbbb	
# 00 2E | 0000 aaaa	Step23 Data (0 - 128)
| 0000 bbbb	
# 00 30 | 0000 aaaa	Step24 Data (0 - 128)
| 0000 bbbb	
# 00 32 | 0000 aaaa	Step25 Data (0 - 128)
| 0000 bbbb	
# 00 34 | 0000 aaaa	Step26 Data (0 - 128)
| 0000 bbbb	
# 00 36 | 0000 aaaa	Step27 Data (0 - 128)
| 0000 bbbb	
# 00 38 | 0000 aaaa	Step28 Data (0 - 128)
| 0000 bbbb	
# 00 3A | 0000 aaaa	Step29 Data (0 - 128)
| 0000 bbbb	
# 00 3C | 0000 aaaa	Step30 Data (0 - 128)
| 0000 bbbb	
# 00 3E | 0000 aaaa	Step31 Data (0 - 128)
| 0000 bbbb	
# 00 40 | 0000 aaaa	Step32 Data (0 - 128)
| 0000 bbbb	
00 00 00 42 |	Total Size

4. Supplementary Material

Decimal and Hexadecimal Table

(An "H" is appended to the end of numbers in hexadecimal notation.)

In MIDI documentation, data values and addresses/sizes of Exclusive messages, etc. are expressed as hexadecimal values for each 7 bits.

The following table shows how these correspond to decimal numbers.

D	H	D	H	D	H	D	H
0	00H	32	20H	64	40H	96	60H
1	01H	33	21H	65	41H	97	61H
2	02H	34	22H	66	42H	98	62H
3	03H	35	23H	67	43H	99	63H
4	04H	36	24H	68	44H	100	64H
5	05H	37	25H	69	45H	101	65H
6	06H	38	26H	70	46H	102	66H
7	07H	39	27H	71	47H	103	67H
8	08H	40	28H	72	48H	104	68H
9	09H	41	29H	73	49H	105	69H
10	0AH	42	2AH	74	4AH	106	6AH
11	0BH	43	2BH	75	4BH	107	6BH
12	0CH	44	2CH	76	4CH	108	6CH
13	0DH	45	2DH	77	4DH	109	6DH
14	0EH	46	2EH	78	4EH	110	6EH
15	0FH	47	2FH	79	4FH	111	6FH
16	10H	48	30H	80	50H	112	70H
17	11H	49	31H	81	51H	113	71H
18	12H	50	32H	82	52H	114	72H
19	13H	51	33H	83	53H	115	73H
20	14H	52	34H	84	54H	116	74H
21	15H	53	35H	85	55H	117	75H
22	16H	54	36H	86	56H	118	76H
23	17H	55	37H	87	57H	119	77H
24	18H	56	38H	88	58H	120	78H
25	19H	57	39H	89	59H	121	79H
26	1AH	58	3AH	90	5AH	122	7AH
27	1BH	59	3BH	91	5BH	123	7BH
28	1CH	60	3CH	92	5CH	124	7CH
29	1DH	61	3DH	93	5DH	125	7DH
30	1EH	62	3EH	94	5EH	126	7EH
31	1FH	63	3FH	95	5FH	127	7FH

D:decimal

H:hexadecimal

- * Decimal values such as MIDI channel, bank select, and program change are listed as one greater than the values given in the above table.
- * A 7-bit byte can express data in the range of 128 steps. For data where greater precision is required, we must use two or more bytes. For example, two hexadecimal numbers aa bbH expressing two 7-bit bytes would indicate a value of aa x 128+bb.
- * In the case of values which have a +/- sign, 00H = -64, 40H = +/-0, and 7FH = +63, so that the decimal expression would be 64 less than the value given in the above chart. In the case of two types, 00 00H = -8192, 40 00H = +/-0, and 7F 7FH = +8191. For example, if aa bbH were expressed as decimal, this would be aa bbH - 40 00H = aa x 128 + bb - 64 x 128.
- * Data marked "Use nibbled data" is expressed in hexadecimal in 4-bit units. A value expressed as a 2-byte nibble 0a 0bH has the value of a x 16+b.

<Example 1> What is the decimal expression of 5AH?

From the preceding table, 5AH = 90

<Example 2> What is the decimal expression of the value 12 34H given as hexadecimal for each 7 bits?

From the preceding table, since 12H = 18 and 34H = 52

18 x 128 + 52 = 2356

<Example 3> What is the decimal expression of the nibbled value 0A 03 09 0D?

From the preceding table, since 0AH = 10, 03H = 3, 09H = 9, 0DH = 13

((10 x 16 + 3) x 16 + 9) x 16 + 13 = 41885

<Example 4> What is the nibbled expression of the decimal value 1258?

```

16 ) 1258
   ) 78 ...10
16 )   4 ...14
   ) 0 ... 4
    
```

Since from the preceding table, 0 = 00H, 4 = 04H, 14 = 0EH, 10 = 0AH, the result is: 00 04 0E 0AH.

Examples of Actual MIDI Messages

<Example 1> 92 3E 5F

9nH is the Note-on status, and n is the MIDI channel number. Since 2H = 2, 3EH = 62, and 5FH = 95, this is a Note-on message with MIDI CH = 3, note number 62 (note name is D4), and velocity 95.

<Example 2> CE 19

CnH is the Program Change status, and n is the MIDI channel number. Since EH = 14 and 19H = 25, this is a Program Change message with MIDI CH = 15, program number 26.

<Example 3> EA 00 28

EnH is the Pitch Bend Change status, and n is the MIDI channel number. The 2nd byte (00H = 0) is the LSB and the 3rd byte (28H = 40) is the MSB, but Pitch Bend Value is a signed number in which 40 00H (= 64 x 12 + 80 = 8192) is 0, so this Pitch Bend Value is 28 00H - 40 00H = 40 x 12 + 80 - (64 x 12 + 80) = 5120 - 8192 = -3072

If the Pitch Bend Sensitivity is set to 2 semitones, -8192 (00 00H) will cause the pitch to change -200 cents, so in this case -200 x (-3072) ÷ (-8192) = -75 cents of Pitch Bend is being applied to MIDI channel 11.

■ Example of an Exclusive Message and Calculating a Checksum

Roland Exclusive messages (RQ1, DT1) are transmitted with a checksum at the end (before F7) to make sure that the message was correctly received. The value of the checksum is determined by the address and data (or size) of the transmitted Exclusive message.

● How to calculate the checksum

(hexadecimal numbers are indicated by "H")

The checksum is a value derived by adding the address, size, and checksum itself and inverting the lower 7 bits.

Here's an example of how the checksum is calculated. We will assume that in the Exclusive message we are transmitting, the address is aa bb cc ddH and the data or size is ee ffH.

$$\begin{aligned} aa + bb + cc + dd + ee + ff &= \text{sum} \\ \text{sum} \div 128 &= \text{quotient} \dots \text{remainder} \\ 128 - \text{remainder} &= \text{checksum} \end{aligned}$$

<Example 1> Setting OSC Wave of Temporary Patch to SUPER-SAW (DT1)
According to the "Parameter Address Map" (p. 8), the start address of Temporary Patch is 10 00 00 00H, the offset address of Tone 1 is 01 00H, and the address of OSC Wave is 00 00H. Therefore the address is;

$$\begin{array}{r} 10\ 00\ 00\ 00\text{H} \\ \quad \quad 01\ 00\text{H} \\ +) \quad \quad 00\ 00\text{H} \\ \hline 10\ 00\ 01\ 00\text{H} \end{array}$$

SUPER-SAW has the value of 06H.

So the system exclusive message should be sent is;

F0	41	10	00 00 41	12	10 00 01 00	06	??	F7
(1)	(2)	(3)	(4)	(5)	address	data	checksum	(6)

(1) Exclusive Status, (2) ID (Roland), (3) Device ID (17),
(4) Model ID (SH-01), (5) Command ID (DT1), (6) End of Exclusive

Then calculate the checksum.

$$\begin{aligned} 10\text{H} + 00\text{H} + 01\text{H} + 00\text{H} + 06\text{H} &= 16 + 0 + 1 + 0 + 6 = 23 \text{ (sum)} \\ 23 \text{ (sum)} \div 128 &= 0 \text{ (quotient)} \dots 23 \text{ (remainder)} \\ 128 - 23 \text{ (remainder)} &= 105 = 69\text{H} \end{aligned}$$

This means that F0 41 10 00 00 41 12 10 00 01 00 06 69 F7 is the message should be sent.

<Example 2> Getting the data (RQ1) of REVERB in USER PATCH:A-2
According to the "Parameter Address Map" (p. 8), the start address of USER PATCH:A-2 is 20 01 00 00H, and the offset address of REVERB is 00 0A 00H. Therefore the start address of REVERB in USER PATCH:A-2 is;

$$\begin{array}{r} 20\ 01\ 00\ 00\text{H} \\ +) \quad \quad 00\ 0A\ 00\text{H} \\ \hline 20\ 01\ 0A\ 00\text{H} \end{array}$$

As the size of REVERB is 00 00 00 51H, the system exclusive message should be sent is;

F0	41	10	00 00 41	11	20 01 0A 00	00 00 00 51	??	F7
(1)	(2)	(3)	(4)	(5)	address	data	checksum	(6)

(1) Exclusive Status, (2) ID (Roland), (3) Device ID (17),
(4) Model ID (SH-01), (5) Command ID (RQ1), (6) End of Exclusive

Then calculate the checksum.

$$\begin{aligned} 20\text{H} + 01\text{H} + 0A\text{H} + 00\text{H} + 00\text{H} + 00\text{H} + 00\text{H} + 51\text{H} &= 32 + 1 + 10 + 0 + 0 + 0 + 0 + 81 \\ &= 124 \text{ (sum)} \\ 124 \text{ (sum)} \div 128 &= 0 \text{ (quotient)} \dots 124 \text{ (remainder)} \\ \text{checksum} &= 128 - 124 \text{ (remainder)} = 4 = 04\text{H} \end{aligned}$$

This means that F0 41 10 00 00 41 11 20 01 0A 00 00 00 51 04 F7 is the message should be sent.

<Example 3> Getting Temporary Patch data (RQ1)

According to the "Parameter Address Map" (p. 8), the start address of Temporary Patch is assigned as following:

10 00 00 00 Temporary Patch

The offset address of Patch is also assigned as follows:

00 00 00	Patch Common
00 01 00	Patch Tone 1
00 02 00	Patch Tone 2
00 03 00	Patch Tone 3
00 04 00	Patch Distortion
00 06 00	Patch Flanger
00 08 00	Patch Delay
00 0A 00	Patch Reverb
00 0C 00	Patch Arpeggio Common
00 0D 00	Patch Arpeggio Pattern (Note 1)
00 0E 00	Patch Arpeggio Pattern (Note 2)
:	
00 1C 00	Patch Arpeggio Pattern (Note 16)

As the data size of Patch Arpeggio Pattern is 00 00 00 42H, summation of the size and the start address of Temporary Patch Arpeggio Pattern (Note 16) will be;

```

10 00 00 00H
00 00 1C 00H
+) 00 00 00 42H
-----
10 00 1C 42H
    
```

And the size that have to be got should be;

```

10 00 1C 42H
-) 10 00 00 00H
-----
00 00 1C 42H
    
```

Therefore the system exclusive message should be sent is;

```

F0 41 10 00 00 41 11 10 00 00 00 00 00 1C 42 ?? F7
(1) (2) (3) (4) (5) address data checksum (6)
    
```

(1) Exclusive Status, (2) ID (Roland), (3) Device ID (17),

(4) Model ID (SH-01), (5) Command ID (RQ1), (6) End of Exclusive

Calculating the checksum as shown in <Example 2>, we get a message of F0 41 10 00 00 41 11 10 00 00 00 00 00 1C 42 12 F7 to be transmitted.

ASCII Code Table

Patch Name, etc., of MIDI data are described the ASCII code in the table below.

D	H	Char	D	H	Char	D	H	Char
32	20H	SP	64	40H	@	96	60H	`
33	21H	!	65	41H	A	97	61H	a
34	22H	"	66	42H	B	98	62H	b
35	23H	#	67	43H	C	99	63H	c
36	24H	\$	68	44H	D	100	64H	d
37	25H	%	69	45H	E	101	65H	e
38	26H	&	70	46H	F	102	66H	f
39	27H	'	71	47H	G	103	67H	g
40	28H	(	72	48H	H	104	68H	h
41	29H	)	73	49H	I	105	69H	i
42	2AH	*	74	4AH	J	106	6AH	j
43	2BH	+	75	4BH	K	107	6BH	k
44	2CH	,	76	4CH	L	108	6CH	l
45	2DH	-	77	4DH	M	109	6DH	m
46	2EH	.	78	4EH	N	110	6EH	n
47	2FH	/	79	4FH	O	111	6FH	o
48	30H	0	80	50H	P	112	70H	p
49	31H	1	81	51H	Q	113	71H	q
50	32H	2	82	52H	R	114	72H	r
51	33H	3	83	53H	S	115	73H	s
52	34H	4	84	54H	T	116	74H	t
53	35H	5	85	55H	U	117	75H	u
54	36H	6	86	56H	V	118	76H	v
55	37H	7	87	57H	W	119	77H	w
56	38H	8	88	58H	X	120	78H	x
57	39H	9	89	59H	Y	121	79H	y
58	3AH	:	90	5AH	Z	122	7AH	z
59	3BH	;	91	5BH	[	123	7BH	{
60	3CH	<	92	5CH	\	124	7CH	|
61	3DH	=	93	5DH	]	125	7DH	}
62	3EH	>	94	5EH	^			
63	3FH	?	95	5FH	_			

D: decimal

H: hexadecimal

* "SP" is space.